

# **Kinoform Lenses for High Energy (>50 keV) Photons and other applications**

*Kenneth Evans-Lutterodt<sup>a</sup>*

*<sup>a</sup>NSLS II, Brookhaven National Laboratory, Upton, NY-11973, USA*

*Author Email: [kenne@bnl.gov](mailto:kenne@bnl.gov)*

Many applications, especially the study of high Z materials, benefit from the use of high-energy x-ray photons (>50 keV) from high brightness accelerator based sources. Focusing optics for such high energies are not widely available, and do not have the quality that is commonplace at lower photon energies (<10 keV). Using silicon kinoform lenses at beamline 1-ID at APS with 51 keV photons, we obtain 1 dimensional focal spot sizes of  $225 \pm 25$  nm at a focal length of 0.25 m with a gain of  $87 \pm 4$ , and a spot size of  $1 \pm 0.1$  microns at a focal length of 2 m with a gain of  $176 \pm 5$ . A point focus was also obtained with a crossed kinoform geometry, similar to the KB mirror geometry, and a point focus of 0.85 microns (v) by 2.3 microns (h) was measured. At a higher energy of 102 keV, we obtained a 1.5 micron spot size. We anticipate that these optics will enable many x-ray microscopy techniques at high photon energies. Finally, we also discuss some x-ray micro-diffraction results obtained on human hair using kinoform lenses at 12.1 keV.